



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,218	11/20/2003	Wen-Chou Vincent Wang	ALTRP100/A1198	3208
51501	7590	05/29/2007	EXAMINER	
BEYER WEAVER LLP			RAO, SHRINIVAS H	
ATTN: ALTERA			ART UNIT	
P.O. BOX 70250			PAPER NUMBER	
OAKLAND, CA 94612-0250			2814	
			MAIL DATE	DELIVERY MODE
			05/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/719,218

Applicant(s)

WANG ET AL.

Examiner

Steven H. Rao

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 and 37-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-16 & 37-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152..

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

***Response to Amendment***

Applicants' amendment filed on March 09, 2007 has been entered and forwarded to the Examiner on March 15, 2007.

Therefore claims 1-16 and 37-40 as recited in the amendment are currently pending in the Application.

Claims 17-36 were previously cancelled.

***Information Disclosure Statement***

To date no IDS has been filed in this Application.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 to 16 and 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiStefano ( U.S. Patent No. 6,709, 895, herein after

Art Unit: 2814

Distefano) previously applied and further in view of Iijima ( Japanese Published Patent Application No. P2003-030767 and the corresponding U.S. Printed Publication No. 2004/0155358, in the rejection below reference will be made to a U.S. publication only for the sake of English language).

With respect to claim 1 Di Stefano describes a semiconductor package comprising: a die having a plurality of layers of low-K dielectric material in the die ( Fig. 2# 61 chip/die, col. 3 line 24., # 2 low -k die electric material ).

Tanaka does not specifically mention the layers of low-K dielectric material in the die.

However, Iijima in para 0008 describes (the well known in the art ) of the layers of low-K dielectric material in the die/chip to provide dies/chips having high thermal resistance to withstand subsequent processing steps using lead free solder, etc. performed under high temperature conditions.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Iijima's chip/die having the layers of low-K dielectric material in the die instead of Tanaka's die in Tanaka's device, the motivation to make the combination is to provide dies/chips having high thermal resistance to withstand subsequent processing steps using lead free solder, etc. performed under high temperature conditions. ( Iijima paras 0006

Art Unit: 2814

and 0007 ).

The remaining limitations of claim 1 are :

Distefano figure 7 # 132-die figure 1 # 32 die dielectric layers 20,26) the die having a top surface, a bottom surface, and a plurality of side surfaces, each surface having associated corner and edge regions, ( Distefano figures land 7, etc.) a wire bonding packaging substrate having a plurality of electrical contacts, ( Distefano figure1 # 66, col. 1 line 61, figure 7 # 440 ) the packaging substrate being positioned under the die ( Distefano fig.1 66 under 32, col.8 lines 55-60, figure 7 shaded portion under 432) ; a plurality of interconnects electrically connecting the die to the plurality of electrical contacts, ( Distefano figure 1 54,col. 7 lines figure 7 # leads not numbered similar to flexible leads 54 in figure 3 ) a molding interface material applied to at least a portion of the top surface of the die, (Distefano figure 1 52 over substrate (chip) 66 figure 7, col. 13 lines 55 to 65, Iijima figure1 8 over substrate (chip) 1 , para 0024 , para 0030 for description of substrate (chip) 1etc. or over chip/substrate 66) the molding interface material being configured to control at least one of tensile and shear stresses experienced by the die; ( Distefano figure 1 52 figure 7, col. 13 lines 55 to 65) and a molding cap covering at least a portion of the die, packaging substrate, interconnects, and molding interface material. ( Distefano ,figure 1 58 figure 7 # 459).

Art Unit: 2814

With respect to claim 2 Distefano describes a semiconductor package as recited in claim 1, wherein the molding interface material is configured to introduce compressive stress to the die, ( it is inherent, that the same material disclosed by Distefano as that claimed by Applicants' will recite the same compressive stress as claimed herein ) thereby strengthening the die against the at least one of tensile and shear stresses. ( it is further inherent that increase in one kind of stress ( compressive ) will reduce the other ( tensile and/or shear stress and strengthen the die against the at least one of tensile and shear stresses.

The recitation, 'wherein the molding interface material controls by applying compressive stress to the die, thereby strengthening the die against the at least one of tensile and shear stresses' is taken to be a hybrid functional and product by process recitation for which patentable weight cannot be given.

With respect to claim 3 Distefano describes a semiconductor package as recited in claim 1, wherein the molding interface material is polyimide. ( Distefano col. 8 lines 9 to 16).

With respect to claim 4 Di Stefano describes a semiconductor package as recited in claim 3, wherein the molding interface material is on at least a portion of the plurality of side surfaces of the die. ( Di Stefano figure 7 encapsulant 458 on sides of 432).

Art Unit: 2814

With respect to claim 5 Di Stefano describes a semiconductor package as recited in claim 4, wherein the molding adjacent portion of the packaging interface material is also on a corresponding substrate in order to secure the die to the packaging substrate. ( Distefano figures 1-7).

The limitation "in order to secure" is also taken to be a product by process limitation for which no patentable weight can be given. See discussion above under claim 2 ( incorporated here by reference ).

With respect to claim 6 Di Stefano describes a semiconductor package as recited in claim 1, wherein the molding interface material covers multiple non-contiguous regions to the top surface of the die. ( Distafano figures1- 7).

With respect to claim 7 Di Stefano describes a semiconductor package as recited in claim 6, wherein at least one of the multiple non-contiguous regions is rectangular in shape. ( Distafano figures 1- 7)

With respect to claim 8 Di Stefano describes a semiconductor package as recited in claim 6, wherein at least one of the multiple non-contiguous regions is triangular in shape. ( Distafano figures1-7)

With respect to claims 9 Di Stefano describes a semiconductor package as recited in claim 6, wherein each of the multiple non-contiguous regions has a thickness of less than 2 microns. (Claim 9 depends from claim 6 and the product by process limitation not being given patentable weight in claim 6 is

Art Unit: 2814

also applicable here.).

With respect to claims 10 and 12, 11Di Stefano describes a semiconductor package as recited in claim 1, wherein the molding interface material is a contiguous region on the top surface of the die excluding corner regions. ( Distafano figure 7)

With respect to claim 1 1 Di Stefano describes a semiconductor package as recited in claim 10, wherein the contiguous region is offset from the corner regions by about 100 to 150 microns. ( DiStefano figures, entire patent) With respect to claim 13 Di Stefano describes a semiconductor package as recited in claim 12, wherein the contiguous region is offset from the edge regions by about 100 to 150 microns. ( rejected for same reasons as claim 11)

With respect to claim 14 Di Stefano describes a semiconductor package as recited in claim 1, wherein the molding interface material has a coefficient of thermal expansion between 5 ppm and 40 ppm. ( Distefano col. 8 lines 17-40, col. 9 lines 18 to 65).

With respect to claim 15 Di Stefano describes a semiconductor package as recited in claim 14, wherein the molding interface material is over a substantial portion of the die such that a stress buffer zone is established between the die and the molding cap. (DiStefano figures 1- 7, col. 13 lines 53-62).

With resPect to claim 16 Di Stefano describes a semiconductor package as



Art Unit: 2814

recited in claim 1, wherein the plurality of layers includes extra low-K dielectric material. ( Di Stefano col. 6 line 3 polyimide known in the art to be low k-dielectric material ).

With respect to claim 37 DiStefano describes a Semiconductor package as recited in claim 1 where the molding interface material is a layer positioned between and in contact with the die and the molding cap. ( Distefano 52 between 32 and 58 figures)

With respect to claim 38 DiStefano describes a semiconductor package as recited in claim 1 wherein the plurality of low-K dielectric material has a CTE between the range of 20 ppm and 50 ppm. ( Distefano col. 8 lines 17-40, col. 9 lines 18 to 65).

With respect to claim 39 Di Stefano describes a semiconductor package as recited in claim 38, wherein the plurality of low-K dielectric material has a dielectric constant between 2.6 and 3.5. ( polyimide dielectric constant between 3.1-3.4, and other materials described in DiStefano)

With respect to claim 40 DiStefano describes a semiconductor package as recited in claim 38, wherein the plurality of low- K dielectric material has a dielectric Constant between 2.2 and 2.6. ( DiStefano col. 7 line 51 to col. 8 line 16).

***Response to Arguments***

Applicant's arguments filed March 15, 2007 have been fully considered but they are not persuasive for the following reasons :

Applicants' contention that, " Destefano's the flexible rear encapsulant 52 of DiStefano is therefore (i) not a molding interface material formed on the top surface of the die 32; and (ii) does not control tensile and/or shear stresses on the top die surface. On the contrary, the flexible encapsulant 52 appears to be filler material. There is no discussion whatsoever describing the filler material 52 acting to relieve or control tensile and/or shear stresses" is not persuasive because :

a) Destefano's flexible rear encapsulant 52 is molding interface material

Applicants' first contention that DiStefano employs no structure that corresponds to the molding interface material is wrong. Distefano describes in its figures 1, 7 etc. # 52- which in col. 7 lines 50 to col. 8 lines 16 includes the same epoxy from same company Dow similar to Applicants' 216 described as any suitable material-page 11 lines 18-22. and DiStefano describes encapsulant 58 ( col 7 line 57 ) which is similar to Applicants' molding cap as defined in their specification page 9 last line and page 10 lines 2-5.

Therefore Destefano's flexible rear encapsulant 52 is molding interface material.

Art Unit: 2814

b) Destefano's flexible rear encapsulant 52 is not a molding interface

material formed on the top surface of the die 32.

Destafano in fig.1 describes 52 over substrate ( chip) 1 .

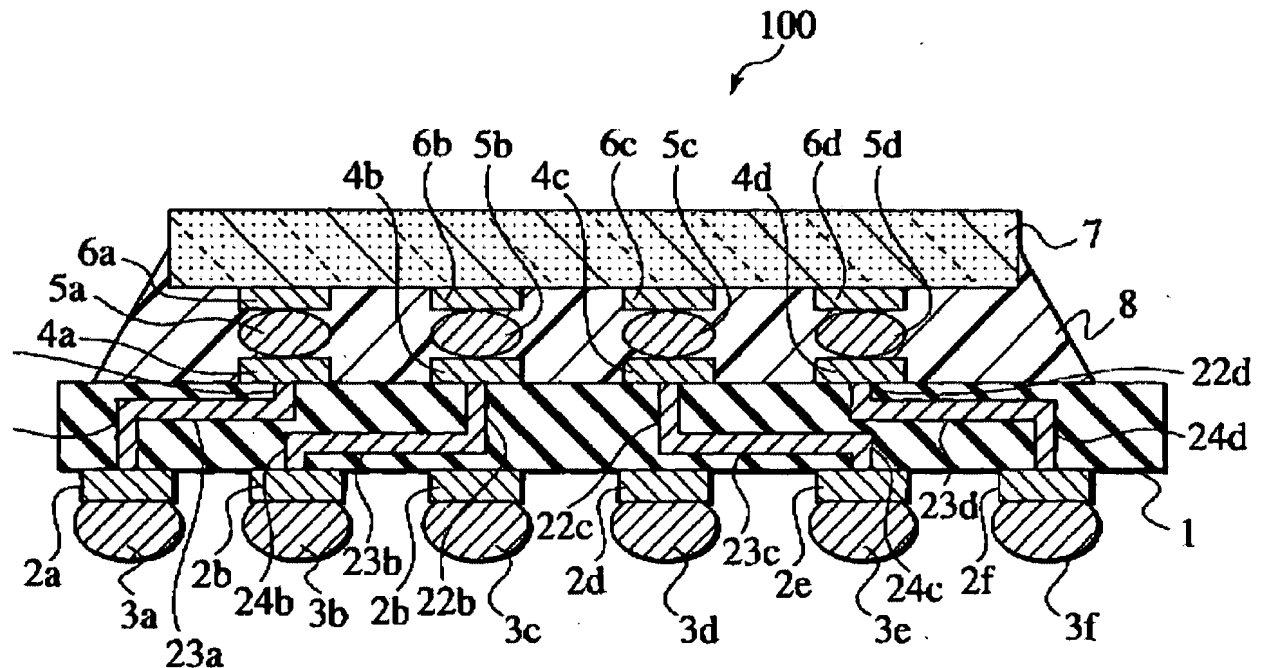
Further Applicants' analysis of the outstanding rejection is an incomplete analysis thereof.

The outstanding rejection (reproduced below ) :

a molding interface material applied to at least a portion of the-top surface of the die, (Distefano figure 1 52 figure 7, col. 13 lines 55 to 65, Iijima figure1 #8 over 1 , para 0024 ,etc. ) .

Iijima figure 1 ( reproduced below ) :

FIG. 1



A can be clearly seen above molding interface 8 is above die 1 ( substrate /die 1 is described in para 0030).

Therefore even assuming ( without conceding) applicants' argument is correct the applied Iijima reference at least in figure 1, etc. shows a molding interface material applied to at least a portion of the-top surface of the die and therefore it is not necessary for the applied Destefano reference to also repeat this teaching.

Therefore the applied Destefano and Iijima references teach describe all of the limitations presently recited in claims.

Applicants' second contention that Destefano and Iijima fails to teach or suggest the use of a molding interface material between the die and the molding cup is not persuasive with regards to claims 1 to 16 and 38-40 because this limitation is not presently recited in these claims and therefore cannot be given patentable weight in determining their patentability.

This limitation is recited in claim 37 and as stated in the rejection is taught at least by Destefano 52 between 32 and 58 in its figures.

Applicants' second contention that Destafno and Iijima do not describe the molding interface material does not control tensile and/or shear stress on the top surface of the die is not persuasive for several reasons :

The limitation , "molding interface material does not control tensile and/or shear stress on the top surface of the die" is not presently recited in any of the claims, only " molding interface material being configured to control at least one of tensile and shear stresses experienced by the die" is presently recited. However this is a particular use limitation for which patentable weight can be given.

Applicants' arguments w.r.t Destefano is not persuasive because in Destafano element 1 is also chips( substrates) and Applicants' arguments are based on only element 32 being the chip.

Art Unit: 2814

Applicants' arguments w.r.t. Iijima also miss the fact that in at least figures 4D, 7D, 9B to 9D and 10 describe molding resin on top surface of die 66.

Therefore all of Applicants' arguments are not persuasive.

Applicants' conclusion that the Examiner withdraw the rejection of claims 1-16 and 37-40 under 35 U.S.C. Section 102 (b) is not fully understood as the outstanding rejection of all claims 1 to 16 and 37 to 40 is under Section 103.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (571) 272-1718. The examiner can normally be reached on 8.30-5.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1714. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2814

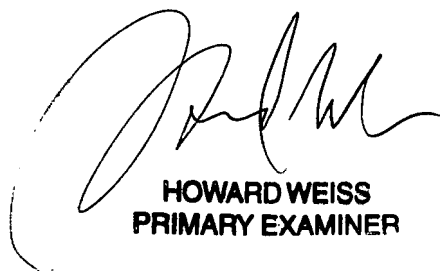
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Steven H. Rao

Patent Examiner

May 02, 2007.



**HOWARD WEISS**  
**PRIMARY EXAMINER**